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Paper 64
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

SING H. **LEE** and WALTER DÄSCHNER
Junior Party[1]
(Patent 6,107,000),

v.

CHE-KUANG **WU**
Senior Party[2]
(Application 09/934,218).

Patent Interference No. 105,326 (SCM)

Before: LEE, MEDLEY, and NAGUMO, Administrative Patent Judges.

NAGUMO, Administrative Patent Judge.

DECISION — PRIORITY — Bd.R. 125(a)

A. Introduction

The parties have each moved for judgment on priority. Neither party requested oral argument. For the reasons that follow, Lee Motion 2 (Paper 42) is GRANTED, and Wu Motion 1 (Paper 46) is DENIED. Accordingly, adverse

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[1] The real-party-in-interest is identified as the Regents of the University of California.

[2] The real-party-in-interest is identified as Canyon Materials, Inc.

judgment is entered AGAINST Wu in the JUDGMENT (Paper 65), which is mailed on the same date as this DECISION.

The subject matter of this interference relates to a method of photolithography in which the mask contains regions having a continuously varying transmissivity. According to the parties, this technology arises from the recognition that a special kind of glass known as "High Energy Beam Sensitive" ("HEBS") glass could be exposed or written on with a 20-30 KeV electron beam, and that the optical density (transmissivity) of the glass would be related to the duration of exposure. After exposing a layer of photoresist to actinic radiation through the mask, the photoresist is developed, i.e., removed in proportion to the transmissivity of the mask at each point. The resulting structure has areas of continuously varying height corresponding to the areas of continuously varying transmissivity in the mask. It appears that the continuously varying transmissivity distinguishes over the prior art, which used discrete, stepped levels of transmissivity, e.g., eight or sixteen levels of gray, to define structures. Because only a single mask is used in the disputed process of this interference, rather than many masks, problems of registration of multiple masks are avoided. According to the parties, these capabilities,

and the capability of removing exposed photoresist in proportion to the degree of exposure on a very fine scale, made the large scale production of Diffractive Optical Elements ("DOE") and other structures requiring high surface resolution readily accessible.

B. Findings of Fact

The following findings of fact[3] as well as those contained else where in this opinion are supported by a preponderance of the evidence of record.

1. Lee is involved on the basis of U.S. patent 6,107,000 ("000 patent," LX 2001[4]) granted 22 August 2000, based on original application 08/766,139, filed 17 December 1996.

2. The inventors for Lee are identified as Sing H. Lee ("Dr. Lee") and Walter Däschner ("Däschner").

3. Wu is involved on the basis of application 09/934,218 ("218 application"), filed 21 August 2001.

4. Wu's 218 application is said to be a continuation-in-part of application 09/507,039, filed 18 February 2000, now U.S. Patent 6,562,523, which is in turn said to be a continuation-in-part of application 08/961,459, filed

[3] Any findings of law should be treated as such.

[4] Lee exhibits are cited as "LX 2___." Wu exhibits are cited as "WX 1___."

30 October 1997, now abandoned, which claims the benefit under 37 C.F.R. § 119(e) of provisional application 60/030,258, filed 31 October 1996.

5. Wu has been accorded the benefit for priority of the parent applications listed *supra*. (Paper 1 at 3.)

6. The inventor for Wu is identified as Che-Kuang Wu ("Dr. Wu.")

7. The real-party-in-interest for Lee is identified as the Regents of the University of California. (Paper 4.)

8. The real-party-in-interest for Wu is identified as Canyon Materials, Inc. (Paper 13.)

9. The sole count is Count 1, which reads:

Lee patent 6,107,000 claim 6

or

Wu application 09/934,218, claim 5.

10. Lee claim 6 is worded identically to Wu claim 5 and is as follows (emphasis added):

> A method for producing various depth levels in a layer of photoresist material including the steps of:
>
> exposing a layer of photoresist material to radiation through a gray scale mask <u>having areas of continuously varying transmissivity</u>;
>
> removing photoresist material from said photoresist layer to depth in said photoresist

layer at a predetermined position thereon corresponding to a predetermined transmissivity of said gray scale mask at a corresponding predetermined position on said gray scale mask; and

providing said gray scale mask as a glass article comprising a body portion and an integral ion exchanged surface layer which, upon exposure to a high energy electron beam, becomes darkened and is substantially insensitive to actinic radiation.

11. The claims of the parties are:

Lee: 1-19

Wu: 1, 3-7, 9-12, 14-17, 19, and 20

12. All of the claims of both parties correspond to Count 1. (Paper 1 at 4.)

13. The Lee 000 patent explains the significance of the continuously varying transmissivity of the gray scale mask in the following words: "Micro-optic devices such as micro-lenses, wave guides and computer generated holograms, for example, often require a geometry which is preferably a continuously curved surface or which has a profile of continuously varying depth from a reference point." (LX 2001 at 4:36-40; emphasis added.)

14. Lee moved for judgment that it is entitled to priority. (Lee Motion 2, Paper 42). Wu opposed (Paper 52) and Lee replied (Paper 59).

15. Wu moved for judgment that it is entitled to priority. (Wu Motion 1, Paper 46). Lee opposed (Paper 51) and Wu replied (Paper 58).

16. Although both parties rely in part on the testimony of inventors and other fact witnesses, neither party has submitted cross-examination testimony of any declarant.

Lee's Priority Case

Lee Conception

17. Lee argues for a corroborated conception on 16 June 1995 when Däschner sent a facsimile to Dr. Wu describing experiments conducted 14-16 June 1995, involving the exposure of a photoresist sample using a gray level mask [2Q8I88] provided by Dr. Wu, and the subsequent development and characterization of the photoresist. (Paper 42 at 13; LX 2005 at 5-8, ¶¶ 15-18, citing Däschner's notebook (LX 2004) and the facsimile, LX 2008.)

18. Däschner testifies that "[t]his gray scale mask exhibited areas of discrete transmissivity." (LX 2005 at 8, ¶ 18.)

19. Däschner testifies further that after developing the photoresist, he "determined the depth profile for each position and recorded the results in nanometers of resist on pages 41 and 42 of my Notebook [LX 2004] and faxed the results on June 16, 1995, to Canyon Materials." (LX 2005 at 8, ¶ 18.)

20. None of Däschner's notebook pages are signed by Däschner, nor are any pages witnessed (signed and dated) by another.

21. Robert Stein testifies that he was the manager of the electron beam facility in the Department of Electrical and Computer Engineering at the University of California, San Diego ("UCSD"), from July 1988 through October 1997. (LX 2003 at 1, ¶ 1.)

22. Stein testified that he had become familiar with Däschner's work and handwriting, and that he had reviewed copies of pages 39-45, said to be from Däschner's notebook. (LX 2003 at 1, ¶¶ 5-6.)

23. Stein testifies, "[b]ased on my familiarity with Walter Daschner's handwriting and recordkeeping as well as the work he was doing, it is my opinion that these notebook pages are records in Walter Daschner's handwriting, and

that these are experiments he was conducting in the time frames indicated thereon." (LX 2003 at 1, ¶ 7.)

24. Däschner's notebook page 41 bears an entry at the top of the page of "05-09-95" and, just over half way down, "06-14-95 Gray level mask w. Canyon Materials," followed by a table of data captioned "darkest grey levels." (LX 2004 at 41.)

25. Däschner notebook page 42 begins with an undated table of data captioned "lightest grey levels," followed by an entry labeled "06-20." (LX 2004 at 42.)

26. Däschner's 16 June 1995 facsimile to Canyon Materials reads in part:

> [a]fter development I measured the remaining resist in the areas with the grey-levels written with 100 nA and written with 25 nA. As you can see the [sic] especially the areas with the lighter dosage came out very nice and we got a almost linear curve up to about 0.30 coulomb/cm^2. For our application this is almost perfect. I will try to generate together with Rob some patterns which will allow us to fabricate some Diffractive Optical Elements.

(LX 2008 at 1; emphasis added.)

27. Däschner testifies:

> This gray scale mask exhibited areas of discrete transmissivity, and in my fax to Canyon Materials I clearly envisioned making a gray scale mask having areas of continuously varying transmissivity because I mentioned that I would generate patterns to fabricate Diffractive Optical Elements, which would necessarily require

> a pattern of continuously varying transmissivity in the gray scale mask.

(LX 2005 at 8, ¶ 18.)

28. Lee argues that Däschner's facsimile corroborates a second date of conception by showing that Däschner conveyed the concept of exposing a photoresist through a continuously varying gray scale mask.

29. Lee never argues that the gray scale mask used in the experiments reported in the 16 June 1995 fax had areas of continuously varying transmissivity.

30. Lee never argues that the 16 June 1995 fax memorializes an actual reduction to practice.

Lee Actual Reductions to Practice

31. Däschner testifies that on 20 June 1995, he recorded another experiment in his notebook (LX 2004 at 42) to make a gray scale mask on HEBS glass. (LX 2005 at 8, ¶ 19, citing .)

32. According to Däschner, on 21 June 1995, he appended a four-page printout of a program from a PDP-11 computer that drove the e-beam writer (LX 2004 at 42a-42d) together with a graph of the resulting resist profile (LX 2004 at 42e). (LX 2005 at 8, ¶ 19.)

33. Däschner testifies that pages 42a-42d "show the location and intensity of each exposure in the e-beam writer that was used to create the gray scale mask for a lens." (LX 2005 at 8-9, ¶ 19.)

34. According to Däschner, "[a] variety of instructions are provided to instruct the e-beam writer to make the gray scale mask in the HEBS glass in the desired spherical and linear patterns. [EXHIBIT 2004]. Thus, as of June 21, 1995, I had programmed the e-beam writer to make a gray scale mask for fabricating a DOE." (LX 2005 at 9, ¶ 19.)

35. Lee argues several actual reductions to practice by 21 July 1995, 9 August 1995, 31 August 1995, and 29 November 1995. (Paper 42 at 14-17.)

36. We find it necessary to consider only Lee's argument for an actual reduction to practice no later than 31 August 1995, based on the production of a diffraction optical element on quartz. (Paper 42 at 15ff.)

37. Däschner testifies that in early August 1995, he made a gray mask scale on a HEBS glass blank, having areas of continuously varying transmissivity using an electron beam; that the resultant mask was substantially insensitive to actinic radiation; that he exposed a layer of photoresist material through the mask and developed the material "to

depth at positions predetermined by the transmissivity of the predetermined positions in the gray scale mask, revealing the continuous nature of the DOE profile." (LX 2005 at 9-10, ¶ 21.)

38. According to Däschner, he then transferred the profile on the photoresist using chemically assisted ion beam etching (CAIBE) to generate a DOE having a continuous profile in quartz. (LX 2005 at 10, ¶ 21.)

39. The record indicates that CAIBE was a well known, standard practice in the art by 1995. (See, e.g., LX 2001 at 3:55-58, recommending CAIBE for mass production.)

40. Däschner testifies that this was "a significant accomplishment for me and others in our lab, and I conveyed this result to Canyon Materials on August 31, 1995." (LX 2005 at 10, ¶ 21.)

41. Lee relies in part on the testimony of Dr. Pin Long ("Dr. Long") to corroborate the actual reduction to practice by 31 August 1995. (Paper 42 at 8.)

42. Dr. Long testifies that he was a post-doctoral fellow working in Dr. Lee's laboratory, and that he worked closely with Däschner on projects involving the fabrication of

diffractive optical elements ("DOE") using gray level masking approaches. (Lee declaration, LX 2006 at 2, ¶ 5.)

43. Dr. Long testifies that he remembers seeing Däschner expose photoresist layers through a HEBS-glass plate gray scale mask having a pattern of areas of continuously varying transmissivity, develop the photoresist material, and remove it. (LX 2006 at 3, ¶ 7.)

44. In Dr. Long's words, "I remember looking with Walter Daschner at the resulting depth levels in the layer of quartz photoresist as this was the first demonstration of a DOE using the new process, and this was by the end of August 1995."

45. Lee also relies on a document labeled as "Report No. 95-108", styled "Joint Efforts of CMI and UCSD on the Fabrication of HEBS Glass Gray Level Mask for DOE Fabrication," authored by Che-Kuang Wu, under Canyon Materials, Inc., letterhead, dated "1/26/96" (LX 2015, hereafter, "CMI Report"), for corroboration. (Paper 42 at 15.)

46. The CMI Report states, "[o]n 8/31/95 Walter Daschner told me he made DOE in quartz using HEBS-gray level mask." (LX 2015 at 4, 2d full paragraph.)

47. The last page of Däschner's notebook offered in evidence is labeled "07-24-95" (LX 2004 at 45), which we read as 24 July 1995.

Wu's Opposition

48. Wu, who appears *pro se*, has filed an Opposition to Lee Motion 2 (Paper 52) that does not conform to standard practice before the Board as set out in the Standing Order (Paper 2) at ¶ 122.3.

49. The majority of Wu's opposition brief is devoted to a recitation of Wu's case-in-chief for priority.

50. Wu does not appear to dispute Lee's account, including the testimony of Däschner or Dr. Long, except to the extent that they imply that they were working essentially independently of Dr. Wu.

51. For example, regarding the quartz DOE Däschner relates having made, Wu argues:

> Wu also provided the N201K HEBS-glass plate subsequently used by Mr. Daschner to make a HEBS-glass gray scale mask. (EXHIBIT 1005 ¶ 41). That gray scale mask was in turn used to expose photoresist and to subsequently produce a complete DOE in quartz. (EXHIBIT 1005 ¶ 41). Those further activities by Mr. Daschner were at the direction of Wu, and constitute further corroborated actual reductions to practice of Wu's invention of Count 1. (EXHIBIT 1005 ¶ 38).

(Paper 52 at 15; emphasis added.)

Wu's Priority Case

52. Wu urges that it proves conception no later than 13 April 1995, when Dr. Wu allegedly described the invention to Stein. (Paper 46 at 7.)

53. More particularly, Dr. Wu testifies that he told Stein about its idea of using a "suitably written HEBS-glass plate" as a gray scale mask that would "permit the mass production of optical elements such as diffractive optical elements." (Wu Declaration, WX 1005 at 10-11, ¶ 24.)

54. Wu does not direct our attention to testimony by Dr. Wu that he envisioned or described to Stein a gray-scale mask having areas of continuously varying transmissivity.

55. Wu urges further that Stein corroborates Dr. Wu's conception. (Paper 46 at 7.)

56. Dr. Wu testifies further that he asked Stein to "identify to me individuals in the Department who would be willing to use my HEBS-glass gray scale mask to make a diffractive optical element." (WX 1005 at 10-11, ¶ 24.)

57. According to Stein, he met with Dr. Wu on or about 13 April 1995, when Dr. Wu showed him a glass plate having "uniformly darkened square patches clearly visible as having different gray scale levels." (WX 1007 at 1, ¶ 4.)

58. Stein testifies that "Dr. Wu explained that the HEBS-glass plate could be used as a gray scale mask, which could be used in a subsequent step to expose photoresist in a substrate. Dr. Wu explained that a gray scale mask constructed using HEBS-glass would permit the manufacture of large numbers of micro-optical elements, such as diffractive optical elements." (WX 1007 at 2, ¶ 5.)

59. Stein does not testify that Dr. Wu described a process involving the step of "exposing a layer of photoresist material through a gray-scale mask having areas of continuously varying transmissivity."

60. Stein testifies further that "Dr. Wu also asked me to identify an individual in the Department who would be willing to use his HEBS-glass gray scale mask to print on photoresist." (WX 1007 at 2, ¶ 5.)

61. According to Dr. Wu, Stein prepared a gray scale pattern on a HEBS-glass plate ("HEBS-glass gray scale mask 2Q8I88") by 24 May 1995, following Wu's instructions. (WX 1005 at 12, ¶ 29.)

62. According to Stein, between 14 April 1995, and 24 May 1995, he exposed a HEBS-glass plate according parameters specified by Dr. Wu, and that he believes the mask 2Q8I88 is the plate that he exposed. (WX 1007 at 2, ¶ 7.)

63. Stein testifies that he examined the plate with a reflection mode microscope, but, because he did not have a transition mode microscope, he could not see gray scale levels within the gray scale patterns. (WX 1007 at 3, ¶ 8.)

64. Stein testifies further, "I returned the written plate to Dr. Wu and he took photomicrographs of the mask patterns with 16 gray levels written in the plate 2Q8I88 for some of the combinations of the writing parameters." (WX 1007 at 4, ¶ 11; emphasis added.)

65. Dr. Wu identifies WX 1014 as a 1x photocopy of mask 2Q8I88. (WX 1005 at 12-13, ¶ 30.)

66. Dr. Wu testifies that he took some 50x transmission mode photomicrographs of the gray scales to show the 16 gray scale levels within one gray scale pattern. (WX 1005 at 13, ¶ 31.)

67. Although Dr. Wu does not expressly say so, it appears that these 50x photomicrographs have been provided as Wu Exhibit 1015.

68. Dr. Wu testifies further that, pursuant to his request, Stein showed the HEBS-glass gray scale mask 2Q8I88 and some photomicrographs (WX 1015) of the gray scales to Däschner. (WX 1005 at 13-14, ¶ 33.)

69. According to Stein, in May 1995, "I explained to Mr. Daschner the properties of HEBS-glass that Dr. Wu described to me . . . I mentioned to Mr. Daschner that Dr. Wu hoped to find someone in Dr. Lee's micro optics group who is able and willing to print the gray scale patterns in the HEBS-glass plate to produce various depth levels in a layer of photoresist corresponding to various gray scale levels in the HEBS-glass mask." (WX 1007 at 3, ¶ 10.)

70. Stein testifies that he reviewed the photomicrographs of Exhibit 1015, and that he believes they are the photomicrographs of the mask 2Q8I88 that he showed Däschner. (WX 1007 at 3, ¶ 9.)

71. Stein does not testify that he described to Däschner a process involving the step of "exposing a layer of photoresist material through a gray-scale mask having areas of continuously varying transmissivity."

72. According to Dr. Wu, Däschner called him after seeing the mask and the photomicrographs to arrange a meeting "to discuss the project further." (WX 1005 at 14, ¶ 33.)

73. Dr. Wu testifies that he met with Däschner at UCSD on 12 June 1995 at 10:00 a.m., and that Däschner "agreed to expose a layer of photoresist material through the gray

scale mask 2Q8I88 to produce various depth levels in the layer of photoresist." (WX 1005 at 14, ¶ 33.)

74. Dr. Wu does not testify that he informed Däschner that the gray scale mask 2Q8I88 contained areas of continuously varying transmissivity.

75. Wu does not direct our attention to any credible evidence that the etched photoresist layer created by Däschner has areas of continuously varying height.

76. Wu does not direct our attention to any credible corroborating evidence in support of his account of his meeting with Däschner on 12 June 1995.

77. According to Dr. Wu, he provided Däschner with a 3" × 3" portion of plate 2Q8I88 on or before 14 June 1995, that would fit the device (a "contact aligner") Däschner would use to expose a photoresist. (WX 1005 at 14-15, ¶ 36.)

78. Dr. Wu testifies that the gray scale pattern on the 3" × 3" mask from 2Q8I88 has areas of continuously varying transmissivity, as shown on sheets 1 and 5 of WX 1015, written with clock rates 10 through 16, using 25 na beam current at 30 kV beam acceleration, and written with clock rates 1 through 8 using 200 na beam current at 30 kV beam acceleration voltage, respectively. (WX 1005 at 19, ¶ 43.)

79. Dr. Wu does not present any quantitative data derived from the photomicrographs shown in WX 1015, such as densitometer traces.

80. It is not apparent to us, from our examination of WX 1015, as it has been provided to us (on a CD-ROM disk), that there are areas of continuous variation in the bands parallel to the labels "CLK 10 5.5E6," etc., on sheet 1 of WX 1015, or at corresponding positions on sheet 5 of WX 1015.

81. Nor is it apparent to us that any variations in gray correspond to variations in the original 3" × 3" gray scale mask on sample 2Q8I88, or to the vagaries of subsequent reproductions.

82. Dr. Wu testifies that Däschner faxed him a letter (a copy has been filed as WX 1022) on 16 June 1995 describing the exposure and development of a photoresist sample with the gray level mask 2Q8I88. (WX 1005 at 15, ¶ 37.)

83. Wu Exhibit 1022 appears to be identical to Lee Exhibit 2008.

84. Wu urges that it proves an actual reduction to practice via the activities of Walter Däschner ("Däschner") on 14-16 June 1995. (Wu priority brief at 10-11.)

85. According to Wu, Däschner carried out those activities at Wu's request, under Wu's direction. (Wu priority brief at 11.)

C. Discussion

The senior party in an interference is presumed to have been the first to invent the subject matter of the Count. Bd.R. 207(a). Accordingly, Lee has the burden of proving, by a preponderance of the evidence, that it reduced an embodiment within the scope of the Count prior to Wu's accorded benefit date. Bd.R. 121(b). If Lee's priority motion is not granted, we need not consider Wu's priority motion, and may directly enter adverse judgment against Lee. However, if Lee's motion is granted, we must consider Wu's motion for priority to see whether Wu proves a date of actual reduction to practice prior to Lee.

(Although both Lee and Wu alleged diligence, neither provided, as required by the Standing Order, a day-by-day account of the inventors' activities, with explanations of any periods of inactivity. S.O. 208.6 (Paper 2). Without a rigorous accounting of activities purportedly proving diligence, including explanations of any periods of inactivity or periods during which other projects were pursued, we are not put in a position to find sufficient

facts to support a conclusion that the activities leading to a reduction to practice were pursued with reasonable diligence under the circumstances. To put it another way, we are not able to find whether periods of inactivity on this project are excusable, or whether they should be charged to a lack of diligence. Under these circumstances, we need not probe the parties' cases for conception, except incidentally, to ensure that the alleged reduction to practice satisfies the requirements that every limitation of the Count was met and that the embodiment worked for its intended purpose.)

In the present case, proof of actual reduction to practice requires proof that a process within the scope of the Count was conducted, and that it worked for its intended purpose. *Cooper v. Goldfarb*, 154 F.3d 1321, 1327, 47 USPQ2d 1896, 1901 (Fed. Cir. 1998). An inventor's testimony as to inventive facts must be corroborated by evidence independent of the inventor. *Brown v. Barbacid*, 276 F.3d 1327, 1335, 61 USPQ2d 1236, 1240 (Fed. Cir. 2002) ("an inventor's testimonial assertions of inventive facts require corroboration by independent evidence.") The reason for this rule is due to "the concern that a party claiming inventorship might be tempted to describe his

actions in an unjustifiably self-serving manner in order to obtain a patent or to maintain an existing patent." *Chen v. Bouchard*, 347 F.3d 1299, 1309, 68 USPQ2d 1705, 1712 (Fed. Cir. 2003). As the Federal Circuit has repeatedly reminded us, "[t]he tribunal must also bear in mind the purpose of corroboration, which is to prevent fraud, by providing independent confirmation of the inventor's testimony." *Price v. Symsek*, 988 F.2d 1187, 1194-95, 26 USPQ2d 1031, 1036 (Fed. Cir. 1993). An inventor, or course, need not be the one who actually reduces an invention to practice. *Cooper*, 154 F.3d at 1331, 47 USPQ2d at 1904-05 ("experiments conducted at the request of an inventor by another party may inure to the benefit of the inventor for purposes of establishing a reduction to practice." (Citation omitted).)

Lee's case for Actual Reduction to Practice

Lee's case for actual reduction to practice is encumbered by a relatively scant record of primary evidence (such as laboratory notebooks that are signed, dated, and reasonably promptly witnessed) in support of its arguments. Accordingly, we shall examine only the most fully developed argument, namely, that Däschner achieved an actual

reduction to practice of an embodiment within the scope of the Count by 31 August 1995.

Lee claim 6 or Wu claim 5, which are identically worded, define the Count and read (bracketed labels added):

> A method for producing various depth levels in a layer of photoresist material including the steps of:
>
> [2] exposing a layer of photoresist material to radiation through a gray scale mask having areas of continuously varying transmissivity;
>
> [3] removing photoresist material from said photoresist layer to depth in said photoresist layer at a predetermined position thereon corresponding to a predetermined transmissivity of said gray scale mask at a corresponding predetermined position on said gray scale mask; and
>
> [1] providing said gray scale mask as a glass article comprising a body portion and an integral ion exchanged surface layer which, upon exposure to a high energy electron beam, becomes darkened and is substantially insensitive to actinic radiation.

Rearranging the verbiage slightly for clarity, the method defining the commonly claimed subject matter has three steps: [1] providing a gray scale mask having certain properties, the most important of which is that it has areas of continuously varying transmissivity; [2] exposing

a layer of photoresist material to actinic radiation through the gray-scale mask; and [3] developing the exposed photoresist layer and removing exposed photoresist to a depth corresponding to the transmissivity of the gray scale mask at any given location.

The Lee 000 patent explains the significance of the continuously varying transmissivity of the gray scale mask in the following words: "Micro-optic devices such as micro-lenses, wave guides and computer generated holograms, for example, often require a geometry which is preferably a continuously curved surface or which has a profile of continuously varying depth from a reference point." (LX 2001 at 4:36-40.)

Däschner testifies that no later than 31 August 1995, he made a gray scale mask having areas of continuously varying transmissivity by exposing a HEBS-glass blank to an electron beam, and that he then exposed a layer of photoresist through the mask and developed the exposed photoresist in such a way that photoresist was removed to a depth that corresponded to the transmissivity of the gray scale mask. Dr. Long testifies that he saw Däschner perform these activities, and Wu accepts that these activities were conducted as described.

We find Däschner's testimony credible. Although Däschner's notebook is unsigned and unwitnessed, Dr. Long and Stein testified that they recognized the handwriting as his, and that the contents reflected the experiments he was conducting at the times indicated in the notebooks. Although we need not determine the merits or relevance of those notebook entries with respect to actual reduction to practice, we find that they show Däschner to know whereof he speaks. We find Dr. Long's corroborating testimony credible. Dr. Long testifies that he worked in Dr. Lee's lab at the same time on similar problems, sometimes in collaboration with Däschner. We find that Dr. Long was both knowledgeable in the relevant arts and well-positioned to see and evaluate Däschner's work. Finally, we note that Wu does not dispute that Däschner did what Däschner says he did, when he says he did it.

Comparing Däschner's activities to the steps recited in the Count, we find that there is no dispute that they correspond to the three steps outlined above, and that the parties do not dispute that all other limitations required of the gray scale mask were fully met. Accordingly, we conclude that Lee proved an actual reduction to practice no later than 31 August 1995, well before Wu's accorded

benefit date of 31 October 1996. In doing so, we leave open for the moment the question of whether Däschner was acting independently of Dr. Wu.

As we have noted, Wu does not contradict any aspect of Lee's argument for its alleged actual reduction to practice except for the alleged independence of Däschner from Dr. Wu. Accordingly, we now turn to Wu's case in chief for priority and evaluate Wu's arguments there.

Wu's case for Actual Reduction to Practice

Wu has the burden of proving, by a preponderance of the evidence, that Däschner was working on behalf of Dr. Wu. Moreover, Wu has the burden of showing that Däschner reduced to practice an embodiment within the scope of the Count no later than 16 June 1995, when Däschner faxed the report that Lee regards as an alternative proof of conception, but not of an actual reduction to practice. We observe that if Wu shows that Däschner learned the disputed invention from Dr. Wu, then, on the present record, all of Däschner's alleged reductions to practice should inure to Wu, as all have been argued to be realizations of the Count.

We first consider Wu's arguments that Däschner learned of the invention from Dr. Wu and was working under Dr. Wu's direction. Wu has relied principally on the testimony of

inventor Dr. Wu. The problem is that Wu has failed to come forward with evidence independent of the inventor that corroborates the inventor's testimony. In particular, Wu has failed to provide evidence corroborating Dr. Wu's testimony that Däschner was working at the behest of Wu. Without impugning Dr. Wu's motivation or perceptions in this regard, there is no basis in the Law for us to accept his word without independent corroboration. We have not been directed to any contemporaneous documents in the record memorializing any agreements or communications between Dr. Wu and Dr. Lee or Däschner or Stein. The failure to corroborate communication of instructions, e.g., on 12 or 14 June 1995, is also fatal to Wu's argument that Dr. Lee and Däschner derived the invention from Dr. Wu.

Moreover, Wu has failed to prove conception of a process within the scope of the Count prior to the alleged actual reductions to practice in June or in August 1995. Because conception is a mental act by the inventor, proof of conception requires a manifestation of that act that stands independently of the inventor and that demonstrates that the inventor indeed had thought of an embodiment of the invention meeting every limitation of the Count. Here, Wu has failed to prove that he had conceived of every

limitation of the Count, in particular, the limitation that the gray scale mask must contain "areas of continuously varying transmissivity." Wu does not explain how this limitation is inherent or evident in Dr. Wu's description to Stein. Nor does Stein testify that he understood Dr. Wu to have conveyed to him the idea of areas of continuously varying transmissivity.

In this regard, we find that Lee's arguments in opposition, that Wu conveyed no more than what is taught in Wu's prior U.S. patent 5,078,771 (LX 2021), have some merit.[5] For example, the 771 patent teaches that "[t]he HEBS glass articles are useful as high energy beam recording media for permanent storage of images or data having a full range of gray scales." (LX 2021 at 5:42-44.) The 771 patent also teaches that "[w]ithin at least one surface of a glass filter of the present invention, the optical density at any point or any portion of the surface area may have a value independent of adjacent points or areas ranging from zero to more than 3." (LX 2021 at 42:20-24.) Moreover, the 771 patent concludes that "[t]he above experiments also demonstrate that the minimum geometries,

[5] Wu's 771 patent is cited on the face of Lee's involved 000 patent. We presume, without deciding (the parties not having raised the issue), that the Count and claims of the parties are patentable over the disclosure of the 771 patent.

e.g., line width, that can be delineated in the products of the present invention is less than 1 micrometer and most likely less than 0.8 micrometer." (LX 2021 at 62:60-64.) At least in hindsight, it appears to be a very small step from making a full range of discrete (stepped) gray scales, with independent values of optical density at adjacent points or areas and using those gray scales to make features on the scale of microns, to making gray scales having "areas of continuously varying transmissivity" and using them to make features having continuously varying (rather than stepped) heights. But, not being directed by Wu to any credible evidence that Dr. Wu had taken that step before 23 April or 16 June 1995, we shall not infer what is Wu's burden to prove.

In this regard, we accord no weight to Stein's testimony. Although Stein testifies as to his "surprise" Däschner "claims to have thought of using the HEBS-glass to make gray scale masks, since that is exactly the process that I had told him Dr. Wu had developed" (WX 1007 at 3-4, ¶ 10), Stein does not testify that Dr. Wu explained to him that the creation of gray scale masks with areas of continuously varying transmissivities (as opposed to adjacent areas having discrete transmissivities) was part

of Wu's invention. Nor does Stein testify that he explained this feature of the invention to Däschner as part of Wu's invention. Stein's testimony that he is "not familiar with the legal requirements for being declared an inventor on a patent" (WX 1007 at 4-5, ¶ 14) is well verified by his silence as to this critical limitation of the Count.

Finally, we conclude that Wu has failed to show that the mask 2Q8I88 Däschner used in the exposure and subsequent etching reported in his facsimile transmission of 16 June 1995 has areas of continuously varying transmissivity, and that the procedures Däschner carried out resulted in an etched photoresist having areas of continuously varying depth corresponding to the pattern on the gray scale mask. Dr. Wu's testimony that bands corresponding to CLK 10 through 16 on sheet 1 of Wu Exhibit 1015, and that bands corresponding to CLK 1 to 10, written at 30 kV beam acceleration voltage shown on sheet 5 of Wu Exhibit 1015, is intriguing, but we are unable to see that this is the case given the record before us. There is no quantitative measure of the optical density (e.g., no densitometer traces), and Dr. Wu does not testify in sufficient detail to permit us to conclude that any

variations in the figures are continuous variations in transmissivity in the original glass masks, or vagaries of reproduction of the exhibit. Nor has Wu directed our attention to any evidence that the etched photoresist layer had corresponding regions of continuously varying depth.

Accordingly, Wu Motion 1 for priority is DENIED.

E. Order

In view of the foregoing findings of fact and considerations, it is:

ORDERED that Lee Motion 2 is GRANTED.

FURTHER ORDERED that Wu Motion 1 is DENIED.

FURTHER ORDERED that a copy of this DECISION shall be entered in the records of U.S. Patent 6,107,000 and U.S. Application 09/934,218.

FURTHER ORDERED that the attentions of the parties are directed to the JUDGMENT entered in Paper 65, which is mailed on the same date as this DECISION.

FURTHER ORDERED that if a settlement is reached, the attentions of the parties are drawn to 35 U.S.C. § 135(c) and Bd.R. 205.

/ss/ Jameson Lee JAMESON LEE Administrative Patent Judge	BOARD OF PATENT APPEALS AND INTERFERENCES
/ss/ Sally C. Medley SALLY C. MEDLEY Administrative Patent Judge	
/ss/ Mark Nagumo MARK NAGUMO Administrative Patent Judge	

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